

times. Although some Peregrines may be persistent in actual chases, we have found no descriptions of repeated attacks on live prey that they have knocked into the sea.

It is well known that Peregrines may burst into a flock, e.g., of shorebirds, then select and pursue a single individual, but in one-on-one attacks many shorebirds dodge well and evade Peregrines (Hunt et al. 1975:121). Treleaven (1977) noted that young Peregrines in the autumn concentrate on snatching unsuspecting waders from the edges of flocks feeding on the shoreline.

Black-bellied Plovers in coastal Kenya tend to fly alone, and not high above the sea, into which they can go as a last resort (not diving directly, as, e.g., can alcids). The plover we observed, whether it had been wounded or driven into the sea by the Peregrine, never actually went beneath the surface, nor did it defend itself. Rather, all its movements were to evade the falcon by lowering its head and fluttering away when the falcon stooped, and to attempt to get airborne. It did not move any distance under its own power during the course of our observations. Our observations suggest that the killing and plucking of a 190–200 g (Cade 1960) Black-bellied Plover presented a major problem to the Peregrine. Its persistence, however, paid off.

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### NORTHERN HARRIER (*Circus cyaneus*). PREDATION OF LESSER PRAIRIE-CHICKEN (*Tympanuchus pallidicinctus*)

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The Northern Harrier (*Circus cyaneus*) is not considered a significant predator of Lesser Prairie-Chicken (*Tympanuchus pallidicinctus*) (Palmer et al. 1988). However, Campbell (1950) reported that Northern Harriers will harass lekking Lesser Prairie-Chickens by repeated lek flushes and an occasional attack. The objective of this paper is to report and describe 5 cases of Northern Harrier predation on Lesser Prairie-Chicken in west Texas.

Throughout 2 spring lekking periods (1987 and 1988), we observed and recorded interactions of Northern Harriers with Lesser Prairie-Chickens during >750 hrs of lek observation (Haukos 1988). The study area was in Cochran and Yoakum Counties, Texas. The area has a sandy

duned topography supporting range cattle production; with dominant vegetation of sand shinnery oak (*Quercus havardii*), sand sagebrush (*Artemisia filifolia*), and bluestem (*Andropogon* spp.) plant communities. Other raptors in the area include Golden Eagle (*Aquila chrysaetos*), Cooper's Hawk (*Accipiter cooperii*), Red-tailed Hawk (*Buteo jamaicensis*), Swainson's Hawk (*B. swainsoni*), Rough-legged Hawk (*B. lagopus*), Ferruginous Hawk (*B. regalis*), and Prairie Falcon (*Falco mexicanus*). The number and composition of raptors on the study site fluctuates greatly during the lekking period as raptors migrate through the area. However, harriers have been observed ground-nesting on the study site (pers. obser.).

Throughout the study, harriers approached and harassed (caused lek display to cease) Lesser Prairie-Chickens on leks. Northern Harriers, alone (females) or in pairs (female and male), quartered leks and caused a full lek flush on 3 of 67 observed lek approaches (4%). During the morning display period ( $\frac{1}{2}$  hr before–2 hrs after sunrise), observed harriers quartered only leks and not areas between leks, causing partial lek flushes in 30% (20 of 67 approaches) of lek approaches. Male prairie-chickens usually ceased displaying when harriers quartered over leks. However, no attacks by harriers on Lesser Prairie-Chickens were observed at leks.

All observed harrier predation of prairie-chickens were on birds away from leks, but within 100 m of a lek. On 10 March 1988, a live juvenile female Lesser Prairie-Chicken was recovered from a female Northern Harrier. The prairie-chicken had been captured on the side of a sand dune dominated by sand shinnery oak. A male harrier was present on the ground near the site. The female harrier was attempting to control the prairie-chicken by standing on her back; however, the prairie-chicken was able to travel several m ( $<10$ ) after the initial attack while the harrier was grasping her. We did not observe any male harrier assistance in subduing the prairie-chicken. Our presence caused the harriers to flush and we were able to retrieve the prairie-chicken. Upon examination, the prairie-chicken had suffered no severe damage (i.e., flight capable) except a puncture wound just below the nape between the wings caused by the raptor's talons. The area immediately surrounding the wound was free of feathers. Prairie-chicken feathers were scattered around the capture site indicating a struggle or plucking by the harrier.

On 23 February 1988 a female harrier was flushed from a recently killed adult male prairie-chicken. Feathers were scattered around the site. An area bare of feathers was found below the nape and the carcass had been decapitated.

On 19 March 1988, a female harrier was flushed from a fresh carcass of a juvenile female prairie-chicken. Prairie-chicken feathers were scattered over the kill area and the carcass had been decapitated. Evidence at the site indicated that the carcass had been dragged from the kill site 10 m into bluestem grass cover, but whether the harrier dragged the carcass is unknown.

On 23 February 1987, an adult male harrier was flushed from a carcass, no more than 2 d old (the carcass was not near the location 2 d previous), of an adult male prairie-chicken. A scattering of feathers was present in an area approximately 7 m in diameter. The carcass had been decapitated.

On 16 March 1988, a juvenile male prairie-chicken was trapped which had talon wounds along with an area free of feathers below the nape. We determined that the bird had likely survived a Northern Harrier attack and was in good condition with no obvious difficulty in flight.

Examination of all birds and carcasses found with Northern Harriers had the following characteristics: (1) a talon wound on the neck which was surrounded by a small area free of feathers; (2) carcasses were decapitated;

and (3) prairie-chicken feathers were scattered around the area representing either a struggle during the kill or plucking by the harrier. We suggest that harriers are probably unable to kill Lesser Prairie-Chickens in flight or deliver death blows with talons. Harriers do appear, however, to be capable of pinning Lesser Prairie-Chickens to the ground and successfully decapitating them.

Northern Harriers have been studied in the presence of Greater and Attwater's Prairie-Chicken (*T. cupido*). Lehmann (1941) noted that harriers repeatedly flushed and dove at Attwater's Prairie-Chicken; no kills were reported. Berger et al. (1962) reported that harriers caused a full lek flush on 38% of all approaches (886) and a partial lek flush on 30% of all approaches. In comparison to this study, harriers cause a full lek flush more frequently in Greater Prairie-Chickens, but partial lek flushes are the same between the 2 studies. Berger et al. (1962) reported 1 observed kill of a Greater Prairie-Chicken by harriers and concluded that "harrier harassment is ordinarily a matter of little consequence."

In all likelihood, few Lesser Prairie-Chickens are probably killed directly by Northern Harriers. However, subsequent mortality by survivors of harrier attacks may occur. Attacked birds may be in a weakened state and subject to a higher probability of predation from other avian and mammalian predators.

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